EFFLUENT DISTRIBUTION SYSTEM

This application claims the benefit of provisional application No. 60/241,297, filed October 18, 2000.

BACKGROUND OF THE INVENTION

This invention relates to sewer disposal systems, and more particularly, to a multi-pipe rockless drain field system.

Septic systems are traditionally used when a facility, such as a home, is not connected to a public sewer system. A typical septic system has a watertight tank, consisting of one or more compartments, from which the sanitary flow is detained to permit concurrent sedimentation and sludge digestion. The septic tank is constructed of materials not subject to decay, corrosion or decomposition, such as pre-cast concrete, reinforced concrete, concrete block or reinforced resin and fiberglass. Bacterial action takes place in the septic tank, and most of the sewer solids decompose, are given off as gases or go out into drainage lines as liquid. The solids that do not compose settle to the bottom of the tank, where they can be easily removed and disposed of safely. The drainage lines for the liquid flows out of the septic tank and into a field. The drainage line is typically a perforated pipe which is surrounded by loose aggregate.

A typical aggregate system uses some form of rock as the aggregate. Such a drainage field is built by digging a trench, then pouring the aggregate, such as crushed rock or gravel, into the trench. The perforated pipe is then laid upon the aggregate. The aggregate and pipe are then covered by topsoil or some other soil cover.

Having a rock-based substance as an aggregate also provides some additional separation through mechanical trickling of the effluent. However, little or no treatment occurs in the rock. Hard rock, such as granite, provides more symmetrical spaces or receivers than a soft rock, such as limestone, however, hard rock weighs more and is more expensive to transport and handle than soft rock. Even though soft rock contains a higher percentage of fines, or rock dust, than hard rock, rock fines have been known to cause early failure of a disposal field. Despite washing soft rock to reduce the high

percentage of fines, the rock tends to break up during transport, which creates more fines. Soft rock breaks at odd angles that, more often than not, cause a nesting effect.

Most governmental entities that regulate septic tanks and drain field requirements, allow 30-35% capacity for a rock field trench. Thus, if a trench is evacuated with dimensions of approximately 30 inches wide by 18 to 30 inches deep and is filled with rock, the best gain in terms of capacity is usually an average of 33%. Thus, there is a 66% loss of capacity due to the aggregate.

To try and improve on the percent lost by using aggregate systems, other systems are now known in the art. One such system is generally classified as a chambered system, where the disposal field comprises plurality of multi-louvered, multi-chambered systems in the disposal field. Even though these systems have increased the average percent capacity used, these systems also have their problems. Chambered systems are usually laid level in a trench. However, because of settling of the soil, the chambers may become tilted, thus allowing soil particles to migrate inward, thereby decreasing the actual capacity and retarding the distribution or loading the low side. Furthermore, chambered systems have been crushed during the back-fill process and have become unstable as a result.

Currently, there are several other types of systems also available. Several involve multi-pipe systems, where a bundle of pipes are laid in a trench. These systems allow for consistency in manufacture and effluent distribution. Such systems, however, require more effort during the installation process since they consist of such a plurality of pipes that more than one installer is generally needed to install a segment of pipes that are interconnected and are stacked side-by-side and on top of each other.

SUMMARY OF THE INVENTION

Towards this end, there is need for a drain field system that does not require the addition of aggregate material and that is simple enough to install by a single installer. Such an invention is an effluent distribution assembly for use with a sewage disposal system. The assembly comprises a polishing pipe having a cylindrical shaped wall where a horizontal diameter separates the polishing pipe into a top half and a bottom half, an inlet at a first end and an outlet at a second end, and a plurality of holes formed

therethrough the wall of said top half. The assembly also comprises a plurality of receiver pipes placed in a same row as the polishing pipe, each receiver pipe having a cylindrical shaped wall, an inlet at a first end and an outlet at a second end, and a plurality of holes formed therethrough the wall. The assembly also comprises a protective covering on a top and sides of the assembly.

In another preferred embodiment, the effluent distribution system comprises a distributing pipe having a cylindrical shaped wall, an inlet at a first end and an outlet at a second end, and a plurality of holes formed therethrough the wall. A plurality of receiver pipes are placed in a same row as the distributing pipe, each receiver pipe having a cylindrical shaped wall, an inlet at a first end and an outlet at a second end, and a plurality of holes formed therethrough the wall. A header manifold for connecting to the first end of the plurality of distributing pipes and a protective covering over a top and two sides of the plurality of distributing pipes are also included.

Both of the above mentioned embodiments are used in a trench having depth, width, and length with a base below ground level and generally parallel to said ground level. 22. In another embodiment for used on a hillside, the assembly comprises a polishing pipe having a cylindrical shaped wall where a horizontal diameter separates said polishing pipe into a top half and a bottom half, an inlet at a first end and an outlet at a second end, and a plurality of holes formed therethrough said wall of said top half. The assembly also comprises a plurality of receiver pipes placed in a same generally vertical row as said polishing pipe, each receiver pipe having a cylindrical shaped wall, an inlet at a first end and an outlet at a second end, and a plurality of holes formed therethrough said wall, and a liquid permeable, soil impervious protective cover on a top and sides of said assembly. In this embodiment, the plurality of receiver pipes are stacked first, generally vertically within the trench and the polishing pipe is stacked on top of the plurality of receiver pipes.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a cross-sectional view of a preferred embodiment of the invention;

FIG. 2 is a cross-sectional view of a prior art distribution pipe;

FIG. 3 is a cross-sectional view of a polishing pipe;

FIG. 4 is a perspective view of the invention, without a soil barrier, connected to a header pipe;

FIG. 5 is an exemplary illustration of the placement of the invention in a trench;

FIG. 6 is a cross section view of the invention with connection bands;

FIG. 7 is an elevational view of a plurality of the invention, without a soil barrier covering, connected to a distribution box;

FIG. 8 is an elevational view of a plurality of the invention connected to a header tee connection (without a soil barrier covering);

FIG. 9 is a cross-sectional view of another configuration of the invention;

FIG. 10 is a side view of the polishing pipe without the receiver pipes;

FIG. 11 is an elevational view of a closed loop configuration using the present invention;

FIG. 12 is a side view of a polishing pipe with an offset adapter;

FIG. 13 is a perspective view of a hillside configuration;

FIG. 14 is a cross-sectional view of another preferred embodiment of the invention;

FIG. 15 is a perspective view of a preferred embodiment of the invention;

FIG. 16 is an elevational view of a plurality of the invention connected to a distribution box;

FIG. 17 is a side view of a distribution pipe without receiver pipes an a soil barrier; and

FIG. 18 is an exemplary illustration of the invention connected to a second embodiment of the invention.

DETAILED DESCRIPTION OF THE DRAWINGS

With reference to the figures, exemplary embodiments of the invention will now be described. Accordingly, preferred embodiments of the invention have been represented by components in the drawings, showing only those specific details that are pertinent to the present invention, so as not to obscure the disclosure with structural details or operational interrelationships that will be readily apparent to those skilled in the art having the benefit of the description herein.

In all embodiments, the present invention is placed in a trench 11, as illustrated in FIG. 1. The trench 11 is rectangular in shape having a depth below ground level. In a preferred embodiment, the width of the trench 11 is approximately 36 inches. Preferably the base 13 of the trench 11 is parallel with a ground level 15. Once the present invention is placed in the trench 11, backfill material, such as topsoil, is placed over the invention 5. In a preferred embodiment, the backfill material forms a mound. In another preferred embodiment, as illustrated in FIG. 9, a mound 29 is created using field dirt and a trench is dug out of the mound.

FIG. 1 illustrates a cross-sectional view of an exemplary embodiment of the effluent distribution assembly 5 of the present invention. The effluent distribution assembly 5 comprises five generally cylindrical pipes. In one preferred embodiment, all pipes are corrugated pipes. In another preferred embodiment, the center pipe, or polishing pipe 10, is a PVC pipe, whereas the other four pipes, or receiver pipes 12, are corrugated pipes. The inner diameter of each pipe is approximately 5-6 inches and the length of each pipe range from 6 to 20 feet. A protective sheeting 14, such as a non-woven cloth or soil barrier fabric, covers the top and both sides of the effluent distribution assembly 5 once the assembly 5 is placed in the trench. This cover 14 is in place to protect the holes, or slots 16, 18, from being clogged by surrounding soil. In a preferred embodiment, the cover 14 is a liquid permeable cover, thus permitting improved liquid distribution properties, since the cover 14 will make contact with the holes 16, 18 because of the weight of the soil above. The center pipe 10 is the distribution pipe, or polishing pipe, and the two pipes 12 on each side of the polishing pipe 10 are receiver pipes 12.

As illustrated in FIGs. 1 and 7, the polishing pipe 10 comprises perforated holes 16 disposed in two generally straight, generally parallel lines, or rows, along the length of the polishing pipe 10. The two lines or rows of perforated holes 16 are spaced at an angle of approximately 120° from each other. Their precise location is approximately 30° above the diameter of the pipe 10 where the diameter is running parallel to a trench's bottom, or base 13, or in other words in a level horizontal plane with respect to the ground 15. The perforated holes 16 range in diameter from 7/16 inches to ¾ inches where the holes 16 are spaced approximately 6 inches apart.

With other multi-pipe systems, holes 18 in a distribution pipe are generally on the bottom facing towards the base of the trench, as illustrated in FIG. 2. Thus, effluent in these systems is already leaving the distribution pipe 20 as soon as the effluent enters the pipe and before the effluent reaches the end of the distribution pipe 20. But as illustrated in FIG. 3, with having two lines or rows of holes 16 30° above the horizontal diameter, where the lines or rows are 120° apart, the effluent enters the pipe 10 and is retained in the pipe 10 until a sufficient quantity is collected, allowing the effluent to exit the discharge holes 16. Thus, the effluent has a better chance of being spread through more of the polishing pipe 10. With the effluent remaining in the pipe 10 longer, secondary settling, or polishing, occurs in the pipe 10 to assist in the process of clarification of the effluent before discharge.

Exiting the polishing pipe, the liquid enters a valley 22 formed by the polishing pipe 10 being next to a receiver pipe. From here the effluent then enters the adjoining receiver pipes 12 and eventually reaches a ground area, or the base of the trench. Since the pipes 10, 12 do not have a seal connection between each other, some of the effluent may also reach the ground, or base of the trench 13, after leaving the polishing pipe 10. As further illustrated in FIGs. 1 and 4, the holes 18 in the receiver pipes are disposed in generally straight, generally parallel lines along the length of each receiver pipe. In a preferred embodiment, each hole 18 is approximately 60 degrees from an adjacent hole. A first hole and fourth hole are aligned perpendicular to the base of the trench, or in a vertical orientation, where the fourth hole is disposed generally at the lowest point of the pipe when positioned in a trench 11. The number of holes 18 in each receiver pipe 12 is approximately six holes 18 where the holes can range in diameter from 7/16 inches to ¾ inches. In another preferred embodiment, each hole 18 is approximately 45 degrees from an adjacent hole where there are 8 holes. The orientation of the holes and size of the holes, or configuration, can be adjusted based on soil type to best optimize effluent distribution. Thus, the holes and placement of the holes, or configuration, may be different for clay soil versus fine sandy soil.

FIG. 5 is an exemplary illustration of the placement of the pipes in a trench. In a preferred embodiment, the receiver pipes 12 are placed in the trench 11 first, resting on the base 13. Once in place, the polishing pipe 10 is then placed in the trench 11 between

the four receiver pipes 12. A soil barrier material 14 is then placed over the pipes and on the side of the outer two receiver pipes 12. Back fill is then placed into the trench, forming a mound. Thus, in constructing the assembly, unlike typical drain fields which require three individuals to prepare and construct a drain field (one person operating a back hoe or tractor and two people preparing the trench and laying the drain field components, the current invention can be constructed with only two individuals (one person operating the tractor and one person preparing the trench and laying the effluent distribution assembly).

As further illustrated in FIG. 6, in another embodiment, to simplify installation the two receiver pipes 12 on each side of the polishing pipe 10 may be connected together, such as by a plurality of plastic bands 20 or connecting devices placed along the length of the pipes. Thus, instead of an installer having to place each pipe individually into a trench 11, which would consume more time, when banded or connected, the installer would only have to place the connected receiver pipes 12 connected together, then the polishing pipe 16, and finally the other connected receiver pipes 12.
FIG. 4 is a perspective view of the invention connected to a header pipe 28. As illustrated in this preferred embodiment, the polishing pipe 10 is made of PVC and the receiver pipes 12 are made of corrugated pipes.

As further illustrated in FIG. 7, a plurality of the invention 5 are connected to a distribution box 30 at a first end of each polishing pipe 10. A septic tank 32 feeds liquid to the distribution box 30 which has several pipes 33 leading to several polishing pipes 10 as embodied in the present invention 5. In a preferred embodiment, the second end of the polishing pipe is closed off with a cap 35. As illustrated in FIG. 8, when a field requires more than one segment of the present invention, such as two 20 foot segments to fill a 40 foot trench 11, once a segment 37 of the present invention is positioned in a trench 11, other sections 38 can be butted up against the second end of the invention or a connector can be used to connect the segments together. In either embodiment, the ends of the receiver pipes 12 are not capped. In another preferred embodiment, as illustrated in FIG. 9, embodiments of the present invention can be placed side by side in the same trench 11 if a trench 11 is wider than 36 inches.

In another preferred embodiment, since additional settlement can collect in the polishing pipe 10, an access port 40, as illustrated in FIG. 10 is connected to an end of the polishing pipe 10. The access port 40 can be connected to either end, or connected anywhere therebetween by bisecting the polishing pipe 10 with a tee connection, or connector (not shown). Here, settlement collected in the polishing pipe 10 can be pumped out of the system. The access port 40 can also be used to inject a root-inhibiting chemical into the assembly. As also illustrated in FIGS. 8, the direction of the polishing pipe 10 can be changed at the end of the polishing pipe 10 by including a tee connection, or connection device 42. In a preferred embodiment, the tee connection 42 is placed at a distance away from the ends of the receiver 12 and polishing pipes 10 so that when a tee connection 42 is connected to a second polishing pipe 10, space is available between the second polishing pipe 10 and the ends of the first set of receiver 12 and polishing pipe10 for receiver pipes 12 to be placed adjacent the second polishing pipe 10. In another preferred embodiment, as illustrated in FIG. 11, the tee connection 42 is placed at the end of a first polishing pipe 10 where the second end of the receiving pipes 12 adjacent to the first polishing pipe 10 are next to the second polishing pipe 10a extending from the tee connection 12. Additional receiving pipes 12b, two on each side of the polishing pipe 10a, are then placed next to the second polishing pipe 10a at locations where the first set of polishing pipes are not next to the second polishing pipe. The illustration in FIG. 11 represents a preferred embodiment of a closed loop system.

Though not shown, a marking signifying the direction pipe 10, 12 should be placed is disposed on each pipe 10, 12. For example, on the polishing pipe 10, a marking such as "UP" could be disposed between the 120° area separating the two rows of holes. Likewise, similar markings can also be applied to the receiver pipes 12 to signify a direction so that the holes 18 are placed in their proper configuration.

The sewage disposal system that the present invention can be connected to also includes a pump lift station. As illustrated in FIG. 12, an offset adapter 49 is connected, via a first end, to an end of the polishing pipe 10. An adapter bushing 39 is connected, via a first end, to a second end of the offset adapter. A pressure line from the pump lift station (not shown) is connected to a second end of the adapter bushing 39.

In another preferred embodiment, the present invention can be stacked vertically in a row when a trench is too narrow to accommodate a horizontal row. Vertical stacking is most appropriate for hillside installation of the present invention. Thus, as illustrated in FIG. 13, the receiver pipes 12 are placed in a stacked, or vertical column inside a trench 11 first. The polishing pipe 10 is the top pipe, or the last pipe placed in the trench 11. As with all other embodiments of the invention, a soil barrier 14 is then placed on the top of the polishing pipe 10 and on the sides of the assembly 5. As further illustrated in FIG. 13, a drop box 59, with an access port 40 is provided as junctions between a plurality of the assembly installed in a hillside.

FIG. 14 illustrates a cross-sectional view of another preferred embodiment of the drain field assembly of the present invention. The drain field assembly comprises five pipes, where the center pipe 50 is a distribution pipe and the two pipes 52 on either side are receiver pipes 52. In this embodiment, a soil barrier, or protective cover, is laid 14 over the top and sides of the pipes 50, 52. Each pipe 50, 52 contain slotted entries 54, where in a preferred embodiment, are spaced 60 degrees apart from an adjacent slot. In a preferred embodiment, a first and fourth slot are aligned vertically or perpendicular to a base of a trench when the pipes are installed. As further illustrated in FIG. 15, the slots 54 are placed in parallel rows running the length of each pipe. In another preferred embodiment, each hole 18 is approximately 45 degrees from an adjacent hole where there are 8 holes. In either embodiment, the orientation of the slots and size of the slots can be adjusted based on soil type. Thus, the slots and placement of the slots may be different for clay soil versus fine sandy soil.

When utilizing the configuration as embodied in FIGS. 15, 16 and 18, fluid enters the drain field through the distribution pipe 50, which then disburses the effluent to the receiver pipes 52. FIG. 16 illustrates an exemplary embodiment of a plurality of the invention connected to a distribution box 30 at a first end of each center distribution pipe 50. A septic tank 32 feeds liquid to the distribution box 36 which has several pipes 33 leading to several distribution pipes 50 as embodied in the present invention. The second end of the distribution pipe 50 is not closed off.

In another preferred embodiment, an access port 40, as illustrated in FIG. 17 is connected to a distribution pipe 50 for pumping out any settlement collected in the

distribution pipe 50. The access port 40 can be located at either end of the distribution pipe 50 or anywhere between the two ends. As also illustrated in FIGS. 17, the direction of the distribution pipe 50 can be changed at the end of the distribution pipe 50 by including a tee connection 42. FIG. 18 illustrates a preferred embodiment where two tee connections, or connection devices, connect two distribution pipes to a third distribution pipe that is perpendicular to the first and second distribution pipes. In another preferred embodiment, not shown, tee connections are not needed. The pipes are simply placed adjacent to each other. In either embodiment, two receiver pipes 52 are placed on both sides of the third distribution pipe 50 in the same row.

While the invention has been described in what is presently considered to be a preferred embodiment, many variations and modifications will become apparent to those skilled in the art. Accordingly, it is intended that the invention not be limited to the specific illustrative embodiment but be interpreted within the full spirit and scope of the appended claims.